09/758,519

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Linnett et al.

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(45) **Date of Patent: *May 14, 2002**

(54) **SOFTWARE PLATFORM HAVING A REAL WORLD INTERFACE WITH ANIMATED CHARACTERS**

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(73) Assignee: **Microsoft Corporation**, Redmond, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

(63) Continuation of application No. 08/272,691, filed on Jul. 8, 1994, now Pat. No. 5,682,469.

(51) **Int. Cl.**[7] **G06T 13/00**
(52) **U.S. Cl.** **345/473**; 345/706
(58) **Field of Search** ..... 345/473, 334, 345/336, 302, 326, 333, 338, 352, 700, 705, 706, 709–713, 714, 715; 463/30–32; 434/307 R; 707/500.1

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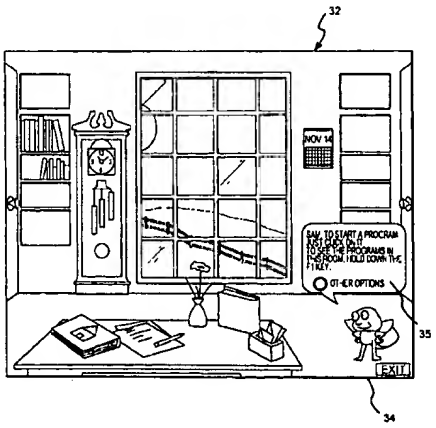
(57) **ABSTRACT**

A software development platform generate a user interface that adopts a real world metaphor. In particular, the user interface appears to a user as containing rooms of a home. The user can specify what rooms are to be included in the home and can specify the style of the appearance of the rooms of the home. The user interface serves as a vehicle for the user to invoke applications and perform tasks. The user interface also generates a personal character for each user. The personal character is an animated guide that helps to assist the user in using the computer. Specialized characters may also be provided to perform specialized tasks.

23 Claims, 20 Drawing Sheets-



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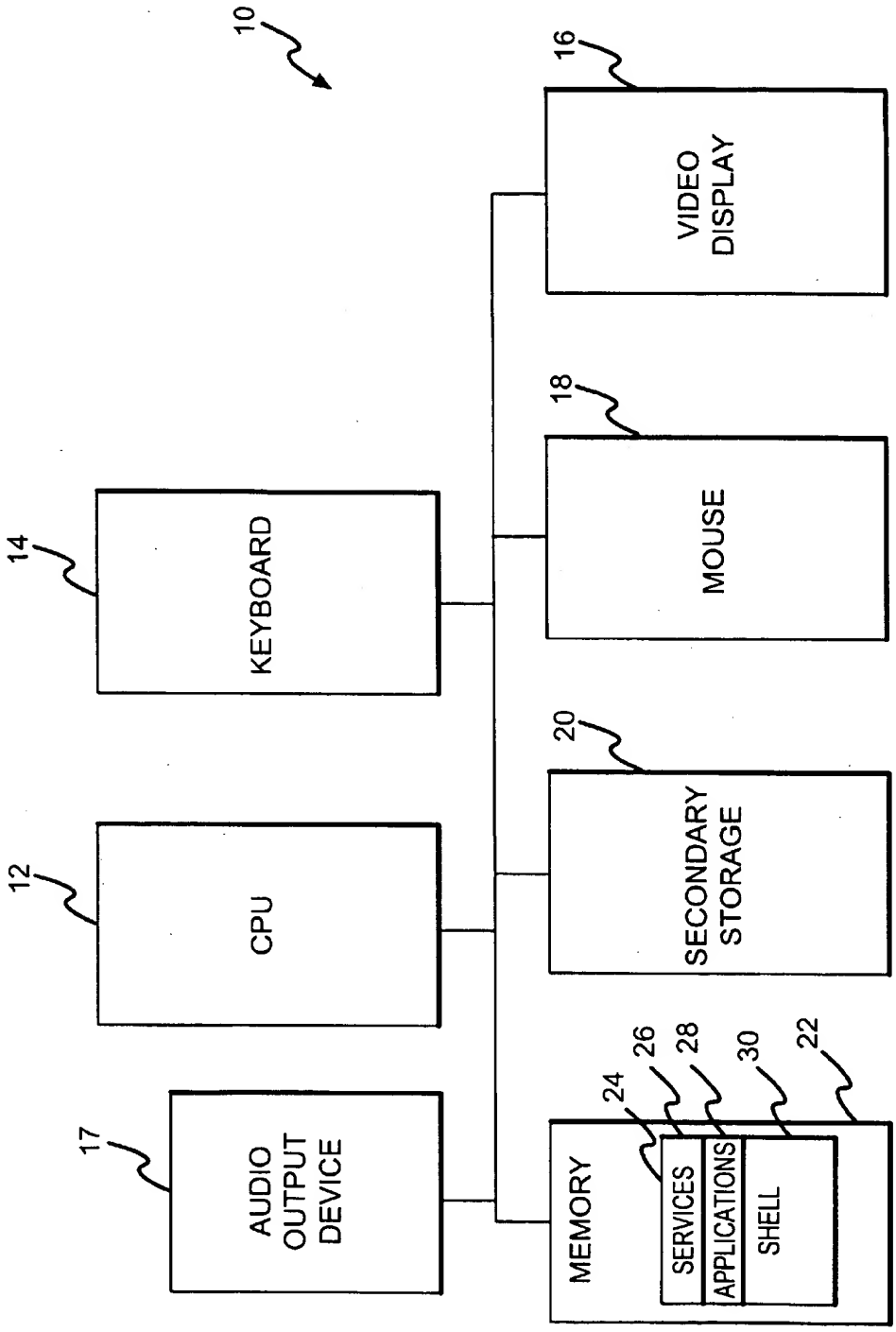
10
16
VIDEO DISPLAY
18
MOUSE
14
KEYBOARD
20
SECONDARY STORAGE
12
CPU
17
AUDIO OUTPUT DEVICE
24
26
28
30
22
MEMORY
SERVICES
APPLICATIONS
SHELL

FIG.1

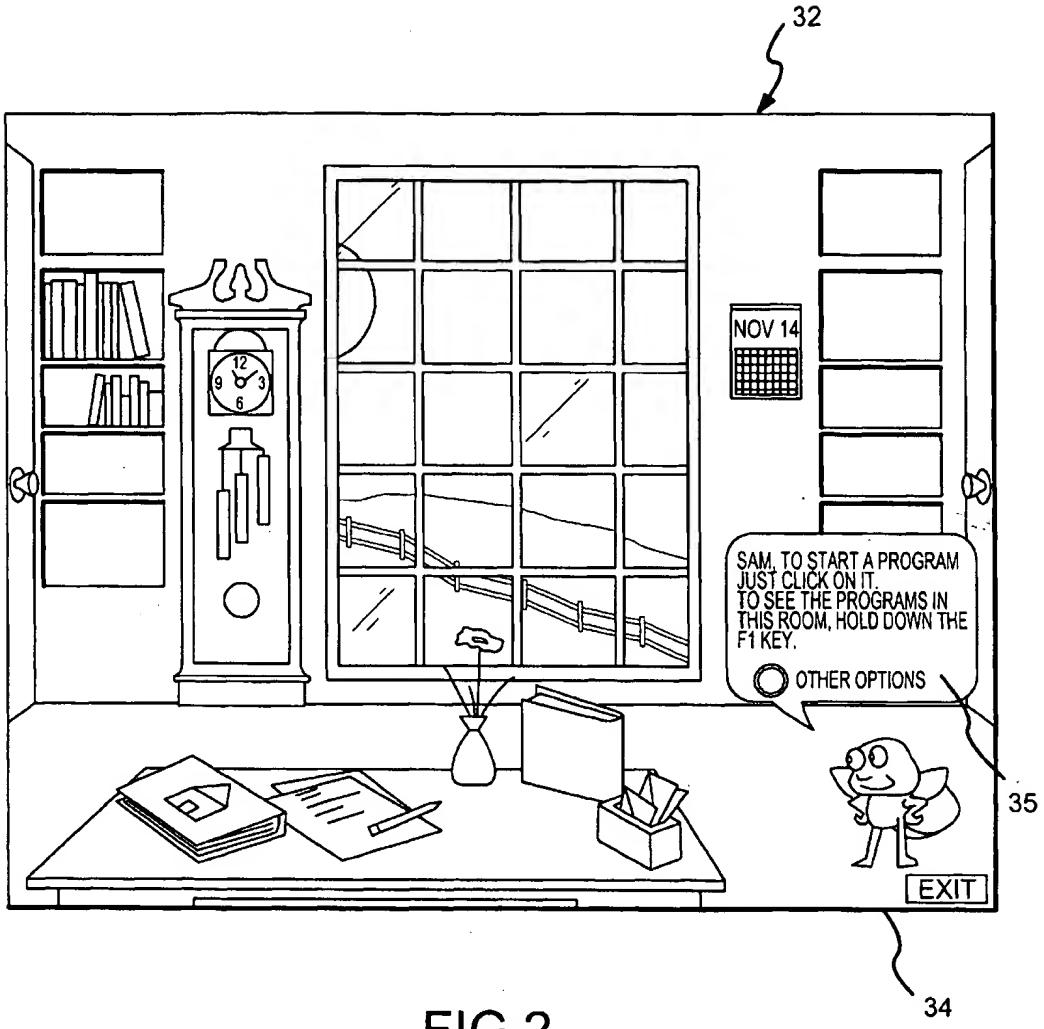
32
NOV 14
SAM, TO START A PROGRAM JUST CLICK ON IT.
TO SEE THE PROGRAMS IN THIS ROOM, HOLD DOWN THE F1 KEY.
OTHER OPTIONS
35
EXIT
34

FIG.2

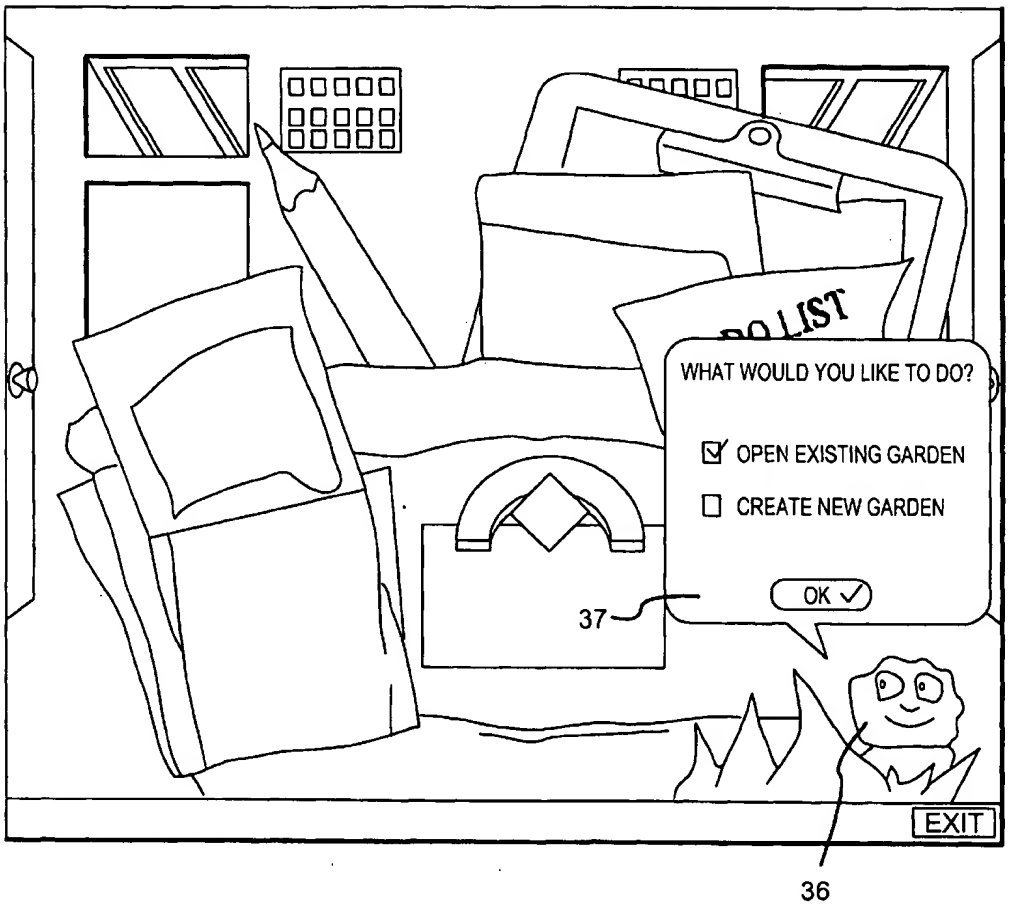
WHAT WOULD YOU LIKE TO DO?
OPEN EXISTING GARDEN
CREATE NEW GARDEN
OK
37
EXIT
36

FIG.3

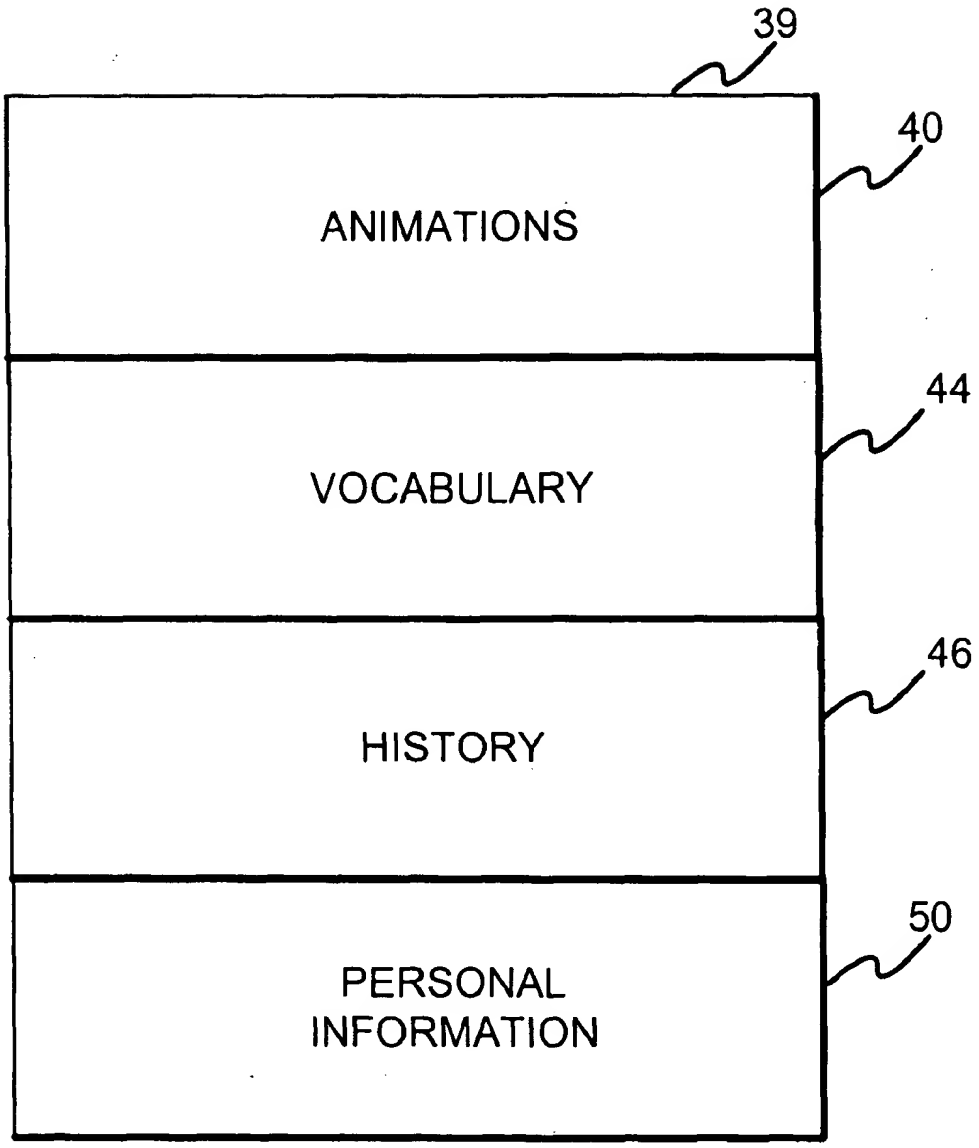
39
40
ANIMATIONS
44
VOCABULARY
46
HISTORY
50
PERSONAL
INFORMATION

FIG.4

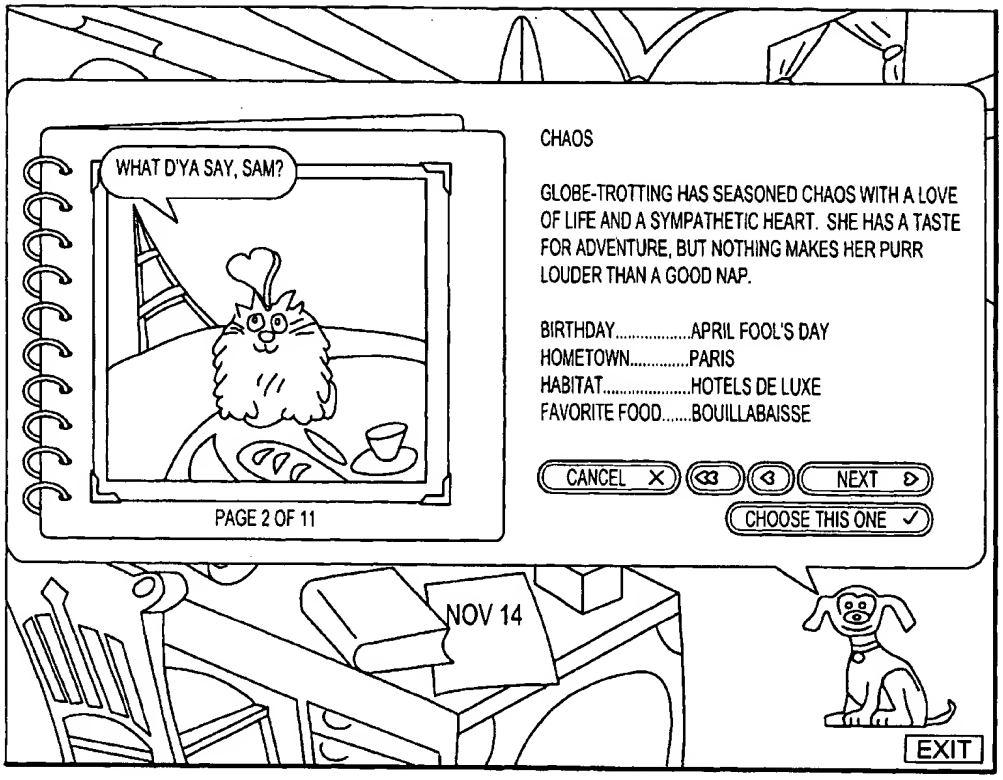
WHAT D'YA SAY, SAM?
PAGE 2 OF 11
CHAOS
GLOBE-TROTTING HAS SEASONED CHAOS WITH A LOVE OF LIFE AND A SYMPATHETIC HEART. SHE HAS A TASTE FOR ADVENTURE, BUT NOTHING MAKES HER PURR LOUDER THAN A GOOD NAP.
BIRTHDAY.....APRIL FOOL'S DAY
HOMETOWN.....PARIS
HABITAT.....HOTELS DE LUXE
FAVORITE FOOD.....BOUILLABAISSE
CANCEL
NEXT
CHOOSE THIS ONE
NOV 14
EXIT

FIG.5

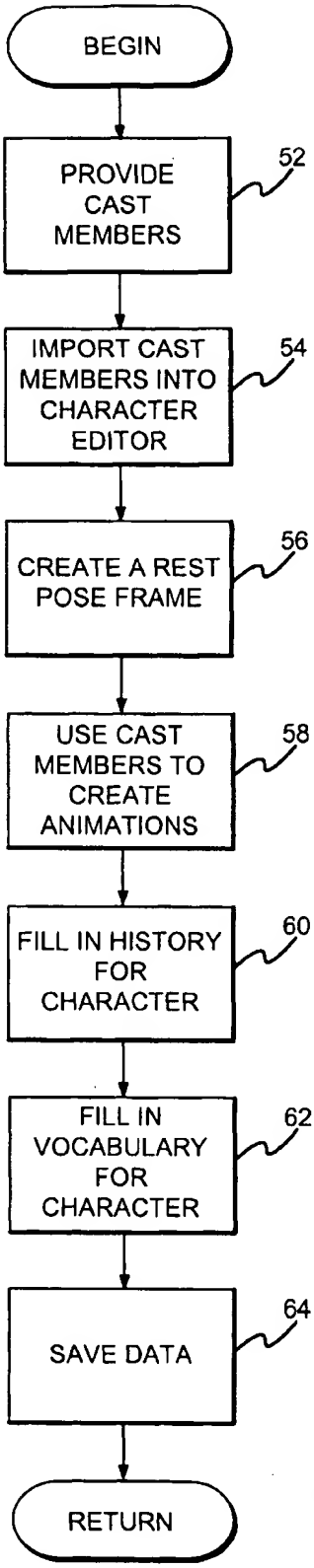
BEGIN
PROVIDE CAST MEMBERS
52
IMPORT CAST MEMBERS INTO CHARACTER EDITOR
54
CREATE A REST POSE FRAME
56
USE CAST MEMBERS TO CREATE ANIMATIONS
58
FILL IN HISTORY FOR CHARACTER
60
FILL IN VOCABULARY FOR CHARACTER
62
SAVE DATA
64
RETURN

FIG.6

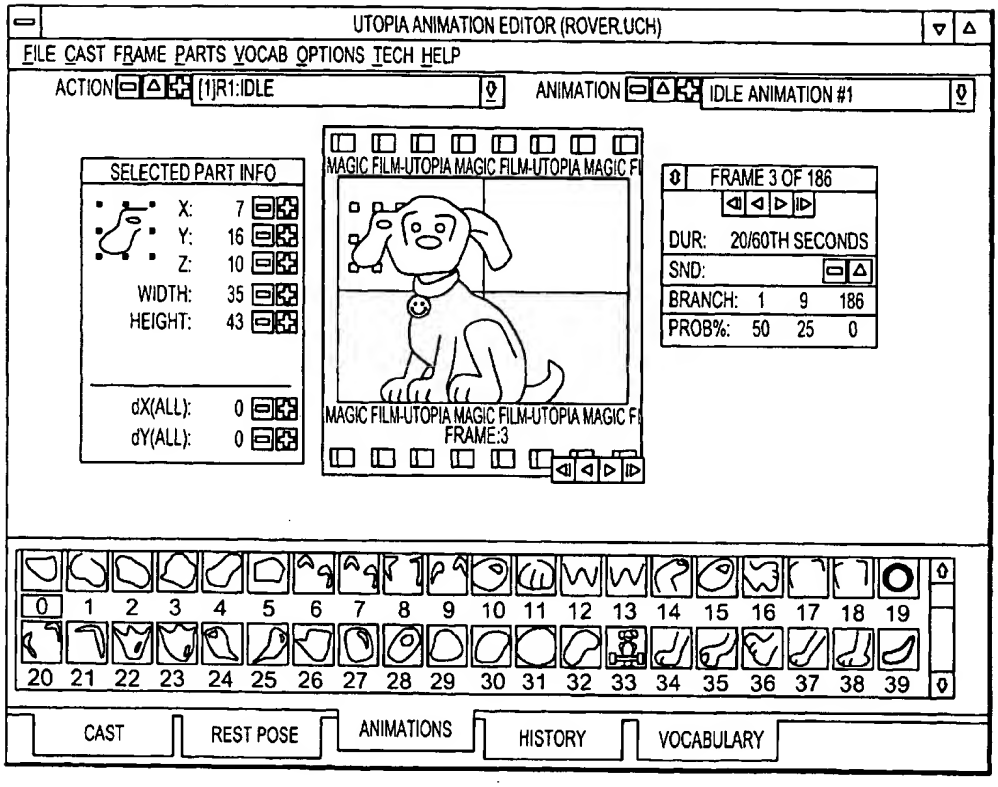
UTOPIA ANIMATION EDITOR (ROVER.UCH)
FILE CAST FRAME PARTS VOCAB OPTIONS TECH HELP
ACTION
[1]R1:IDLE
ANIMATION
IDLE ANIMATION #1
SELECTED PART INFO
X: 7
Y: 16
Z: 10
WIDTH: 35
HEIGHT: 43
dX(ALL): 0
dY(ALL): 0
MAGIC FILM-UTOPIA MAGIC FILM-UTOPIA MAGIC FI
MAGIC FILM-UTOPIA MAGIC FILM-UTOPIA MAGIC FI
FRAME:3
FRAME 3 OF 186
DUR: 20/60TH SECONDS
SND:
BRANCH: 1 9 186
PROB%: 50 25 0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
CAST
REST POSE
ANIMATIONS
HISTORY
VOCABULARY

FIG.7

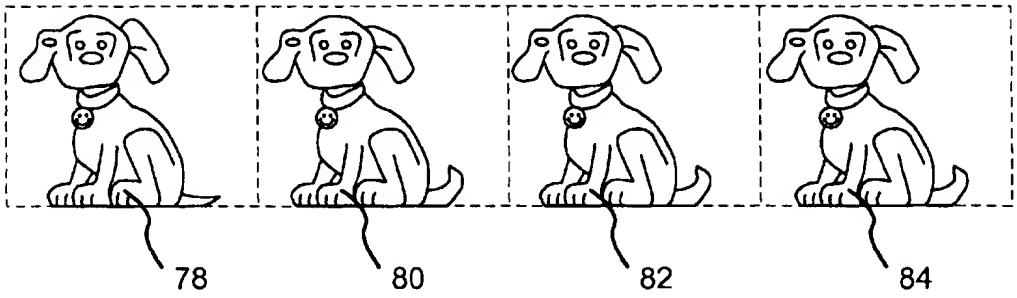

FIG.8

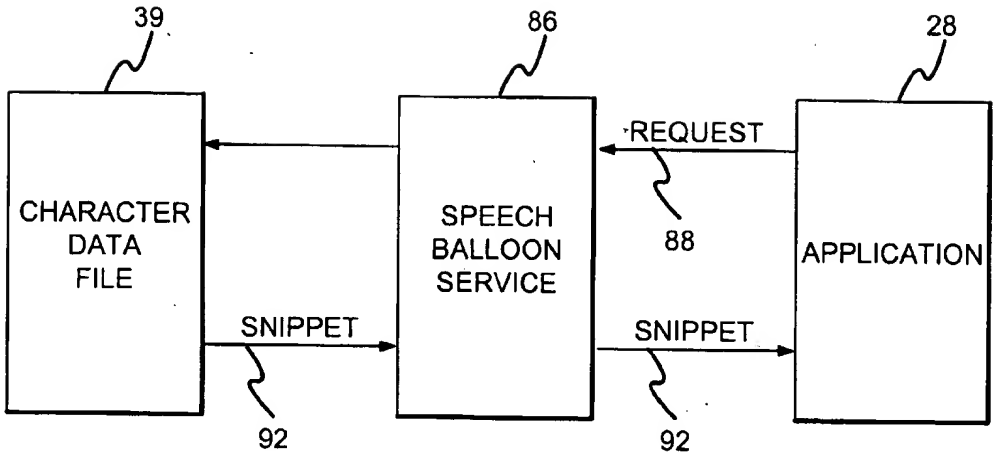
39
86
28
CHARACTER DATA FILE
SPEECH BALLOON SERVICE
APPLICATION
REQUEST
88
SNIPPET
92
SNIPPET
92

FIG.9A

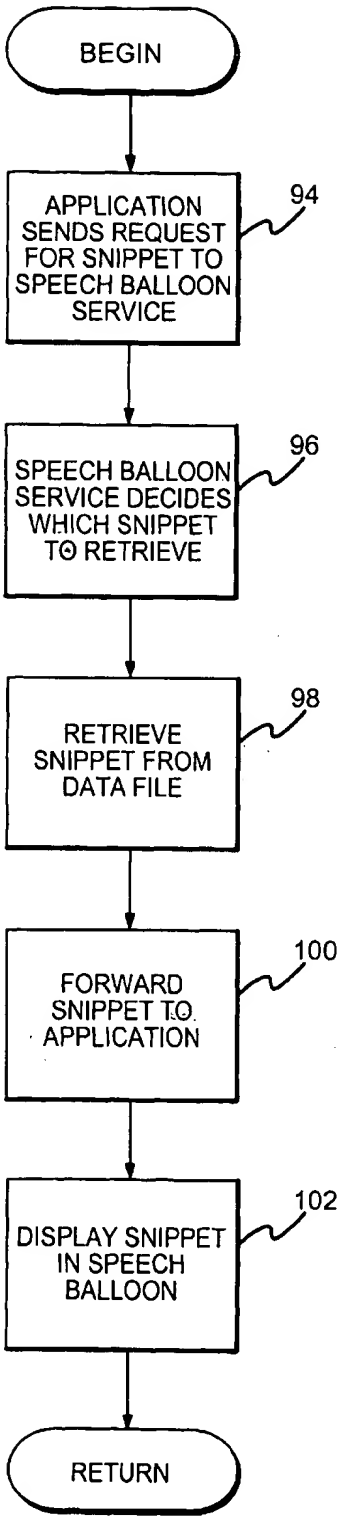
BEGIN
APPLICATION SENDS REQUEST FOR SNIPPET TO SPEECH BALLOON SERVICE
94
SPEECH BALLOON SERVICE DECIDES WHICH SNIPPET TO RETRIEVE
96
RETRIEVE SNIPPET FROM DATA FILE
98
FORWARD SNIPPET TO APPLICATION
100
DISPLAY SNIPPET IN SPEECH BALLOON
102
RETURN

FIG.9B

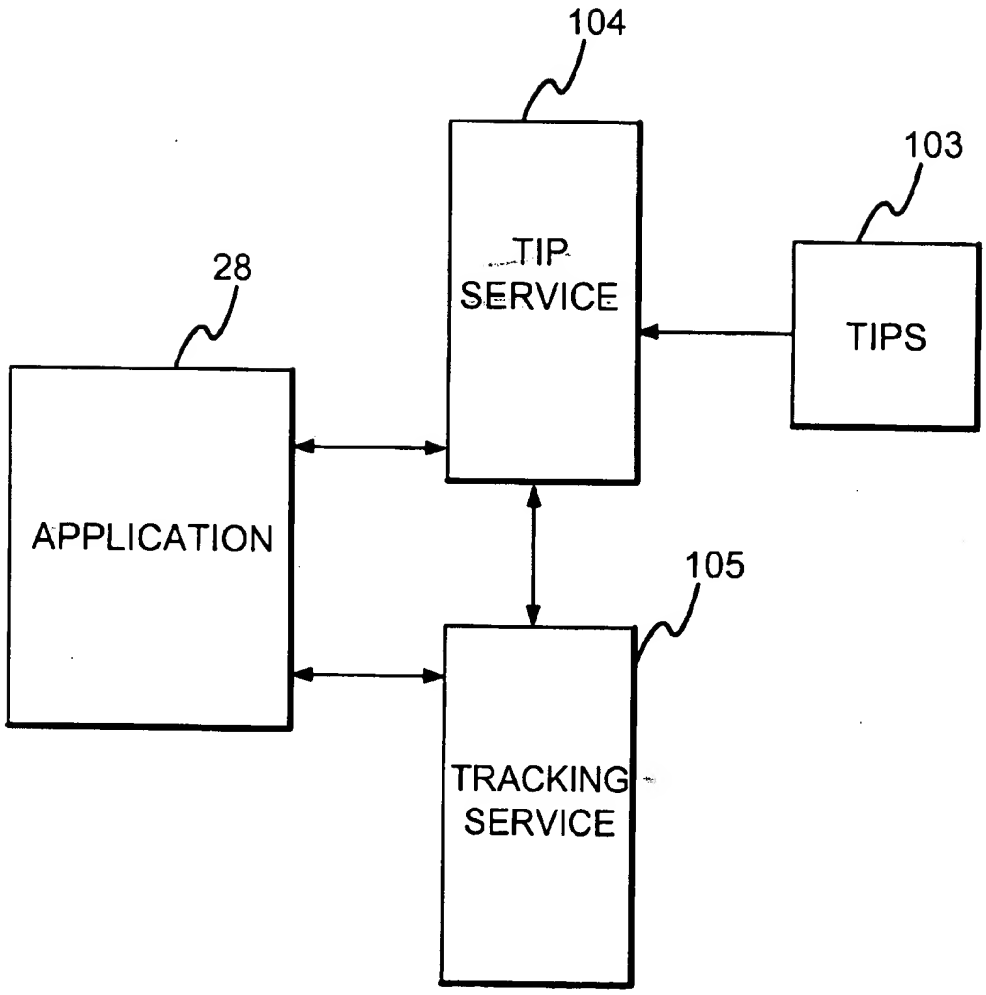
104
103
TIP SERVICE
TIPS
28
APPLICATION
105
TRACKING SERVICE

FIG.10A

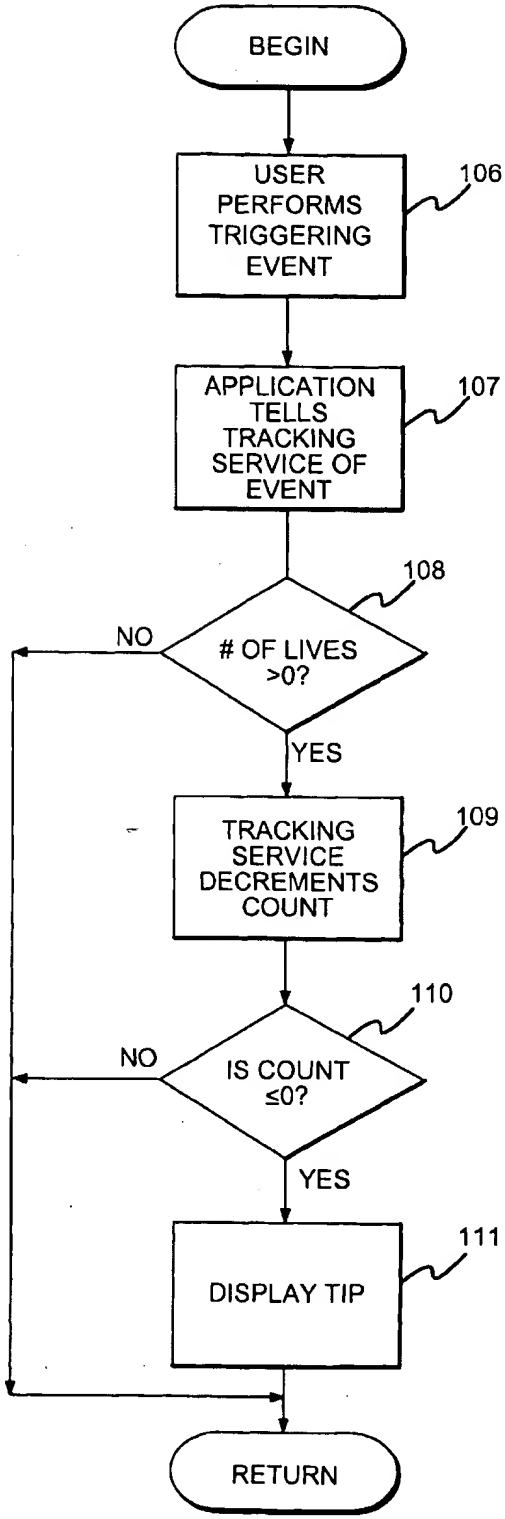
BEGIN
USER PERFORMS TRIGGERING EVENT
106
APPLICATION TELLS TRACKING SERVICE OF EVENT
107
108
OF LIVES >0?
NO
YES
TRACKING SERVICE DECREMENTS COUNT
109
110
IS COUNT ≤0?
NO
YES
DISPLAY TIP
111
RETURN

FIG.10B

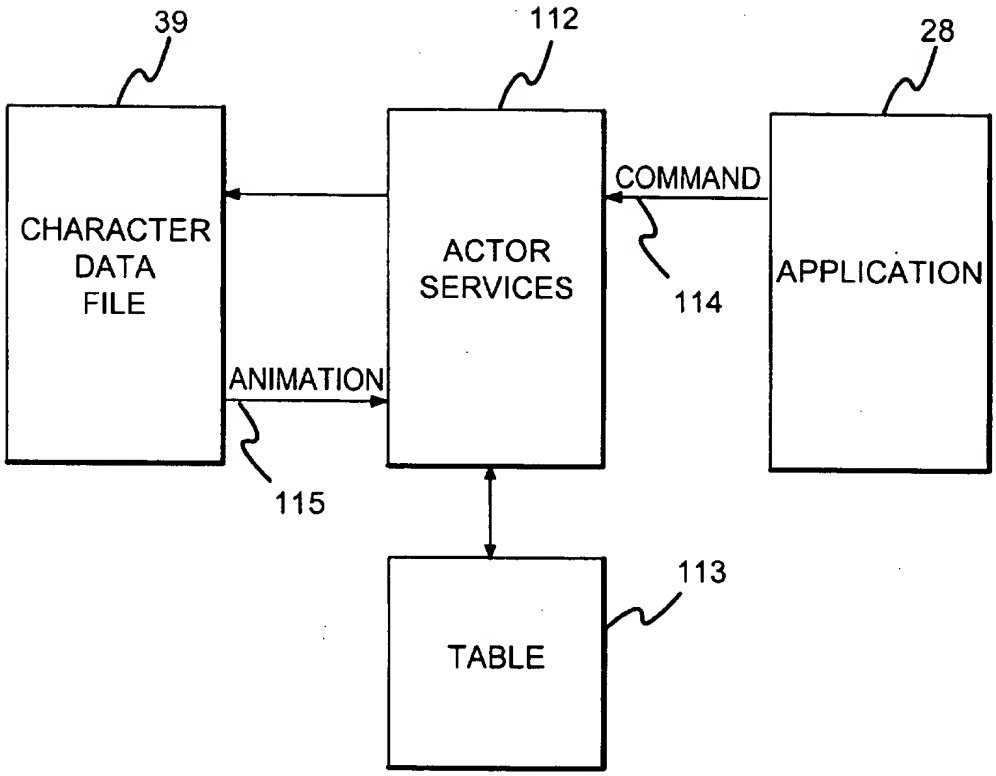
39
112
28
CHARACTER DATA FILE
ACTOR SERVICES
APPLICATION
COMMAND
114
ANIMATION
115
113
TABLE

FIG.11A

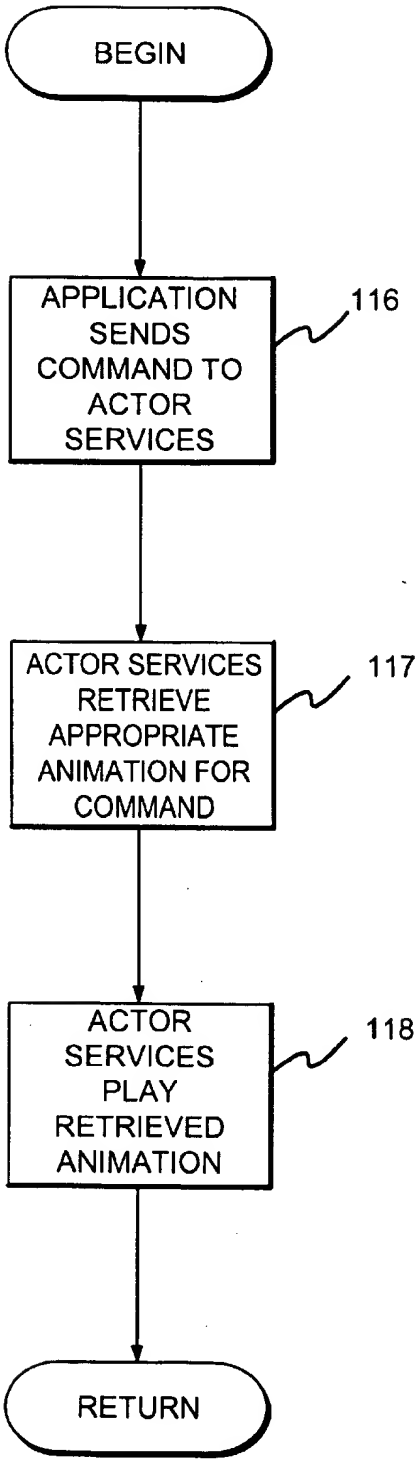
BEGIN
APPLICATION SENDS COMMAND TO ACTOR SERVICES
116
ACTOR SERVICES RETRIEVE APPROPRIATE ANIMATION FOR COMMAND
117
ACTOR SERVICES PLAY RETRIEVED ANIMATION
118
RETURN

FIG.11B

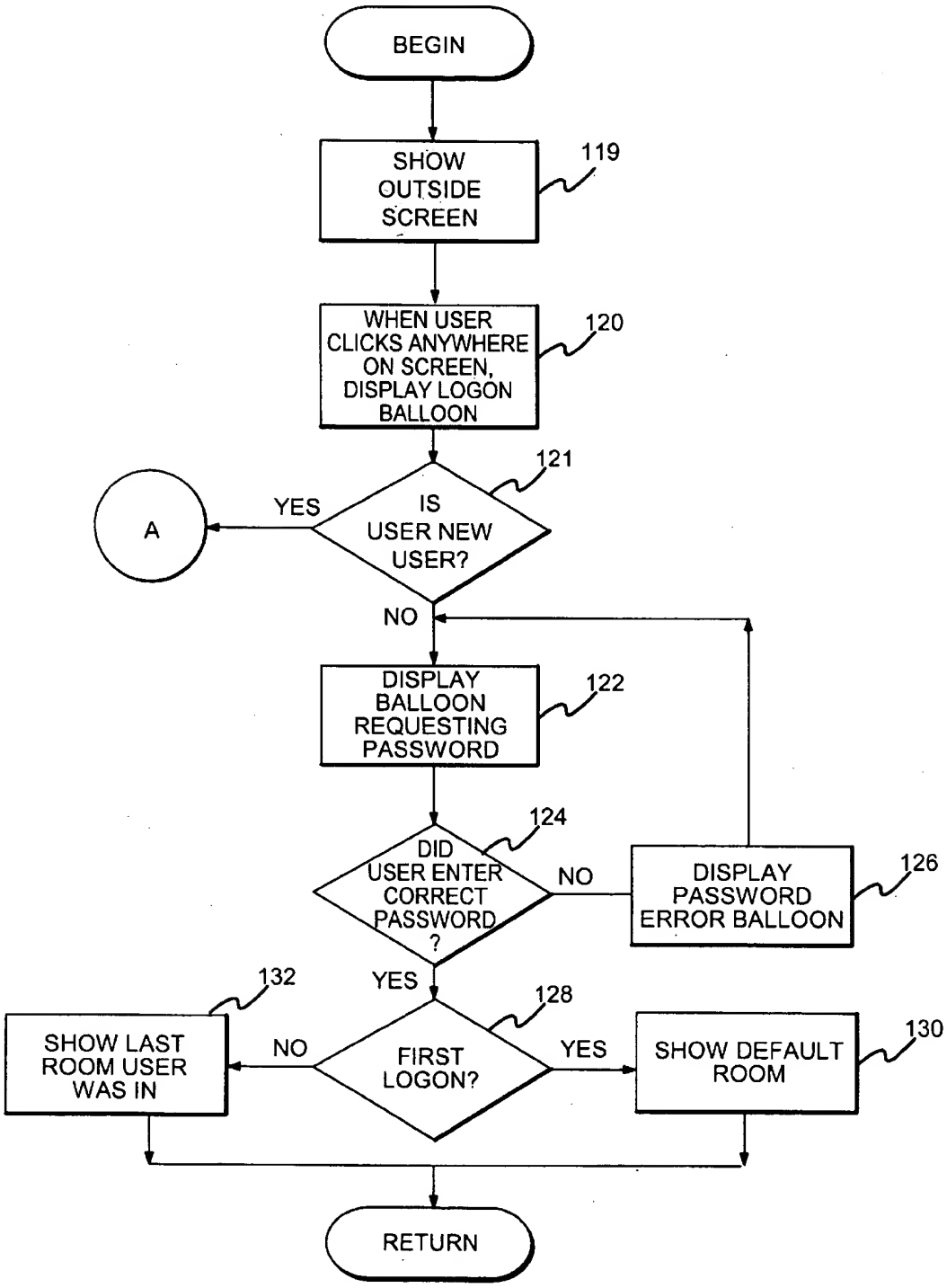
BEGIN
SHOW OUTSIDE SCREEN
119
WHEN USER CLICKS ANYWHERE ON SCREEN, DISPLAY LOGON BALLOON
120
IS USER NEW USER?
121
YES
A
NO
DISPLAY BALLOON REQUESTING PASSWORD
122
DID USER ENTER CORRECT PASSWORD ?
124
NO
DISPLAY PASSWORD ERROR BALLOON
126
YES
FIRST LOGON?
128
NO
SHOW LAST ROOM USER WAS IN
132
YES
SHOW DEFAULT ROOM
130
RETURN

FIG.12

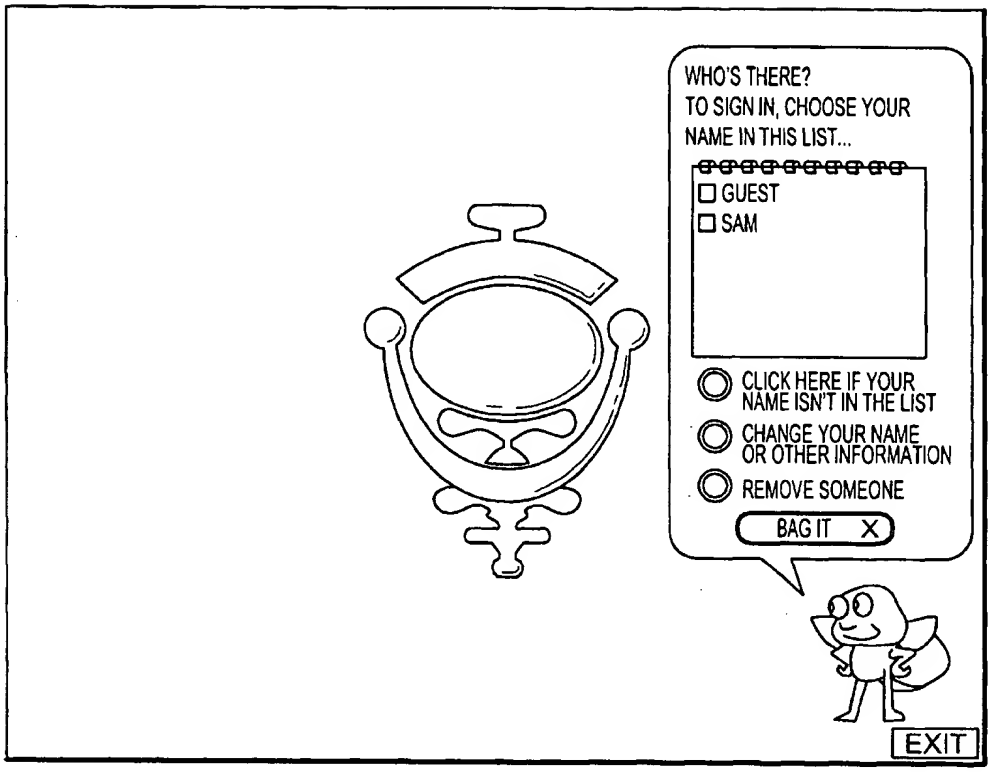
WHO'S THERE?
TO SIGN IN, CHOOSE YOUR NAME IN THIS LIST...
GUEST
SAM
CLICK HERE IF YOUR NAME ISN'T IN THE LIST
CHANGE YOUR NAME OR OTHER INFORMATION
REMOVE SOMEONE
BAG IT
EXIT

FIG.13

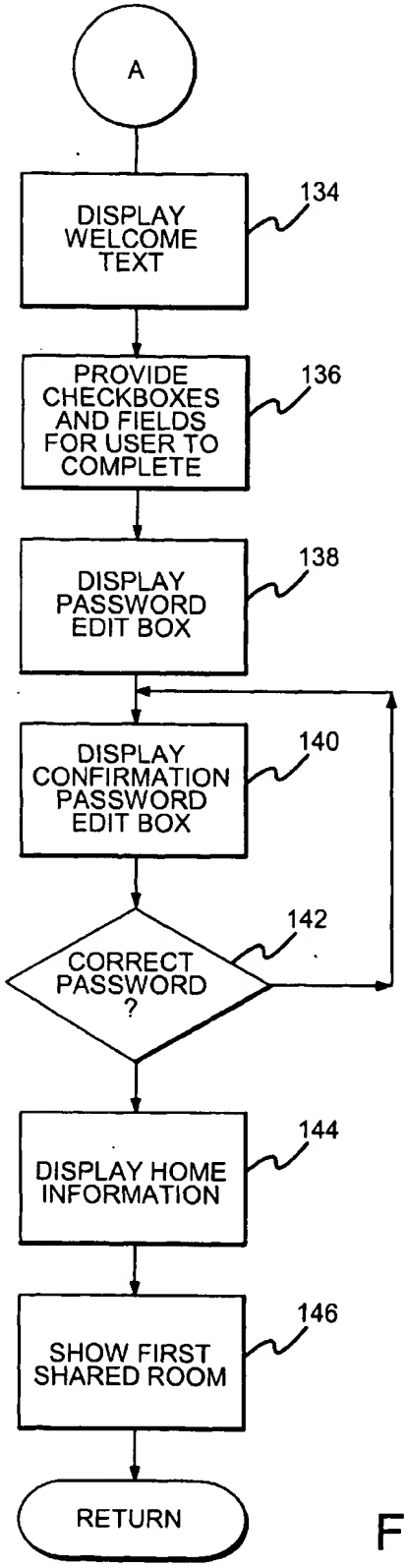
A
DISPLAY WELCOME TEXT
134
PROVIDE CHECKBOXES AND FIELDS FOR USER TO COMPLETE
136
DISPLAY PASSWORD EDIT BOX
138
DISPLAY CONFIRMATION PASSWORD EDIT BOX
140
CORRECT PASSWORD ?
142
DISPLAY HOME INFORMATION
144
SHOW FIRST SHARED ROOM
146
RETURN

FIG.14

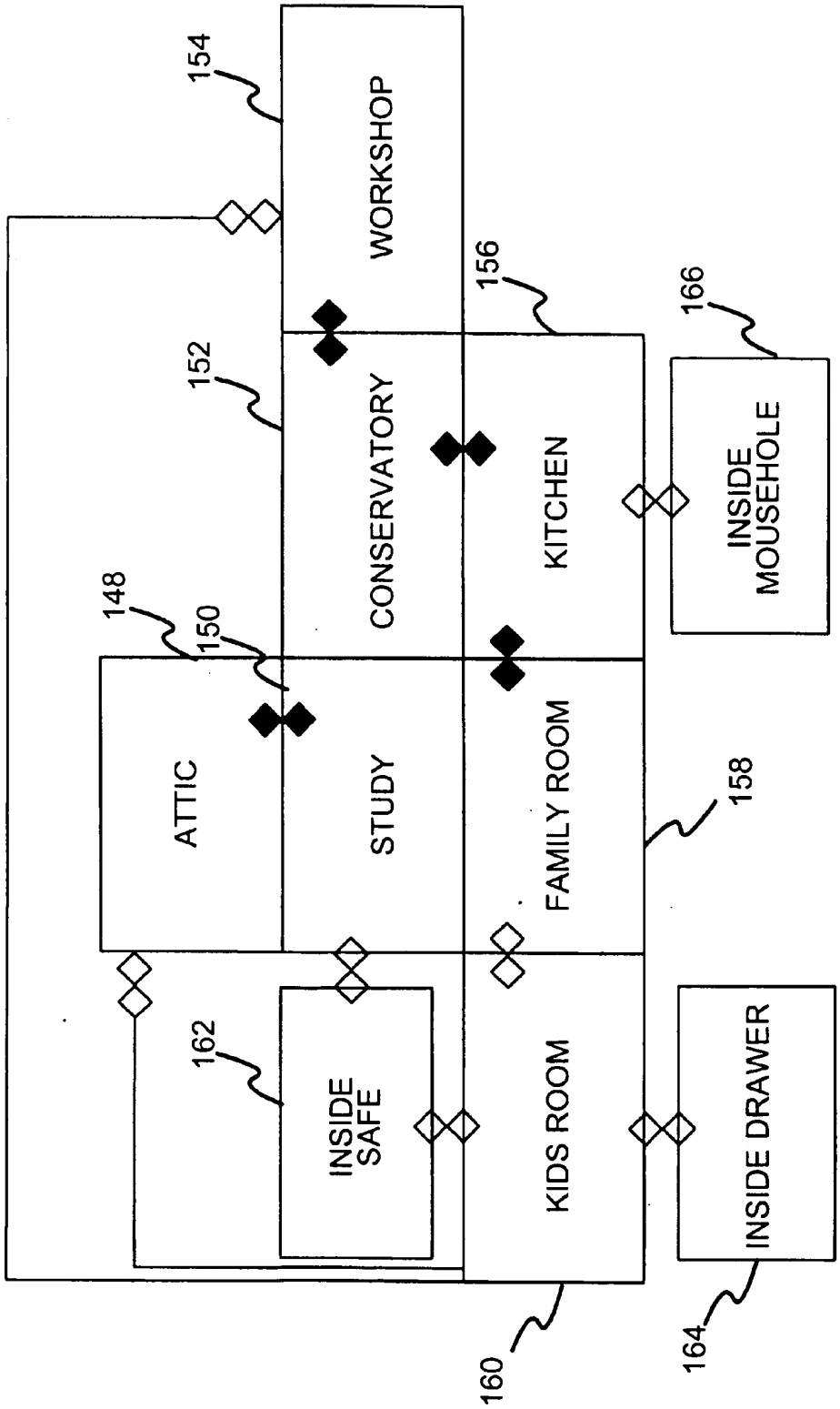
154
WORKSHOP
156
166
152
CONSERVATORY
KITCHEN
INSIDE MOUSEHOLE
148
150
ATTIC
STUDY
FAMILY ROOM
158
162
INSIDE SAFE
KIDS ROOM
INSIDE DRAWER
160
164

FIG.15

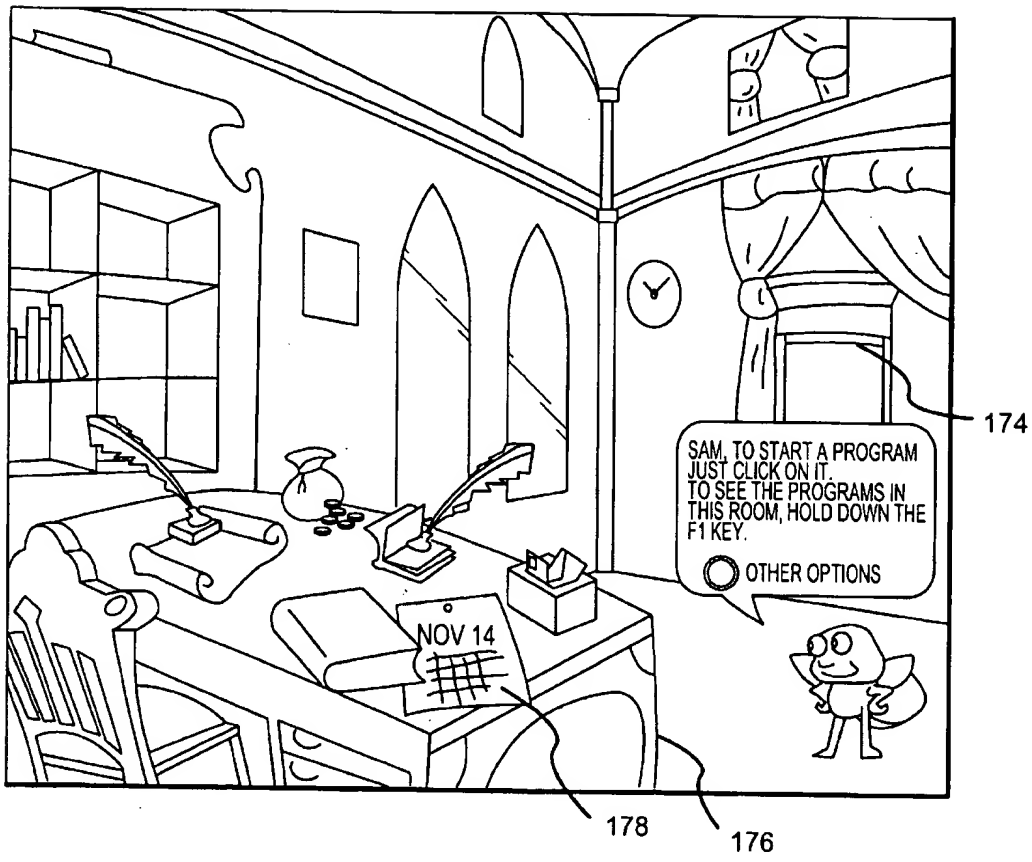
SAM, TO START A PROGRAM JUST CLICK ON IT.
TO SEE THE PROGRAMS IN THIS ROOM, HOLD DOWN THE F1 KEY.
OTHER OPTIONS
NOV 14
174
178
176

FIG.16

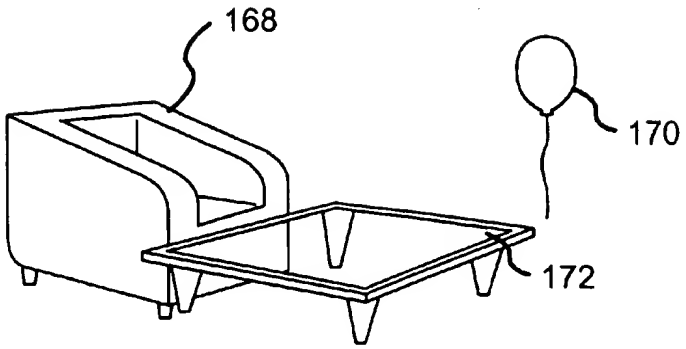

FIG.17A

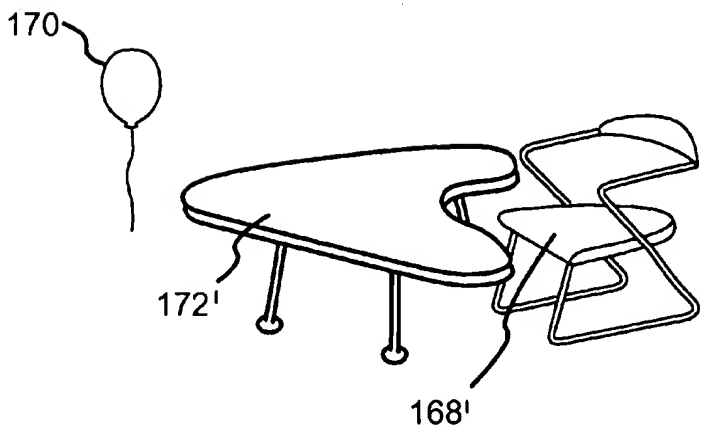

FIG.17B

SOFTWARE PLATFORM HAVING A REAL WORLD INTERFACE WITH ANIMATED CHARACTERS

This application is a continuation of 08/272,691, filed Jul. 8, 1994, now U.S. Pat. No. 5,682,469.

TECHNICAL FIELD

The present invention relates generally to data processing systems and, more particularly, to software development platforms in data processing systems.

BACKGROUND OF THE INVENTION

Many conventional software products provide user interfaces that are difficult to use. These user interfaces are particularly difficult for novice users to use. Such novice users often feel intimidated by the user interfaces. Unfortunately, a user must typically undergo extensive training before he feels comfortable using the user interfaces of such software products.

SUMMARY OF THE INVENTION

The shortcomings of the user interfaces of the prior art are overcome by the present invention. In accordance with the first aspect of the present invention, a method is practiced in a data processing system having a video display, a storage for storing computer programs, a processor for running the computer programs and a system level service for displaying at least one animated character on the video display. The computer programs include an application program and a program for displaying a system user interface from which the application program may be invoked. In accordance with this method, the program for displaying the system user interface is run on the processor. While the program is run, an animated character is displayed on the video display via the system level service. Assistance is provided to the user via the animated character. When running the application program on the processor, the animated character is displayed on the video display via the system level service. Assistance is provided to the user via the animated character.

In accordance with an additional aspect of the present invention, a method is practiced in a data processing system having a processor for running computer programs, storage for storing the computer programs and a video display. In this method, a current user is provided with a selection of personal characters from which the user may choose. In response to a choice by the user of a desired personal character, a character selected by the user is assigned to the user. Whenever any of the computer programs are run, the desired personal character is displayed on the video display for the current user and assistance is provided to the current user through the personal character.

In accordance with another aspect of the present invention, a method is practiced in a data processing system having a video display. In this method, an animated personal character is provided for a user. The animated personal character is displayed on the video display to assist the user in using the data processing system. A specialized task is invoked within the data processing system. When the specialized task is invoked, the personal character is replaced with an animated specialized character. The animated specialized character is displayed on the video display and provides assistance to the user for the specialized task.

In accordance with a still further aspect of the present invention, a method is practiced in a data processing system having a video display and a character editor. In the method, the character editor is used to interactively create a personal character for a user. The character created using the character editor is displayed on the video that is displayed to assist the user in using the data processing system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a data processing system that is suitable for practicing a preferred embodiment of the present invention.

FIG. **2** is a diagram of a contemporary style study as provided by the preferred embodiment of the present invention.

FIG. **3** is a diagram illustrating an example specialist character in an application program according to the preferred embodiment of the present invention.

FIG. **4** is a diagram illustrating the components of a data file for a character in accordance with the preferred embodiment of the present invention.

FIG. **5** is a diagram of an example of the user interface provided by the preferred embodiment of the present invention to enable a user to select a personal character.

FIG. **6** is a flow chart of the steps performed by the preferred embodiment of the present invention to create a new character.

FIG. **7** is a diagram depicting a sample screen of a character editor of the preferred embodiment of the present invention.

FIG. **8** is a diagram illustrating an exemplary video frame sequence for an animation in accordance with the preferred embodiment of the present invention.

FIG. **9A** is a block diagram illustrating the interaction between an application, a speech balloon service and the character data file in obtaining a vocabulary snippet in the preferred embodiment of the present invention.

FIG. **9B** is a flow chart illustrating the steps performed by the preferred embodiment of the present invention to obtain and display a vocabulary snippet in a speech balloon.

FIG. **10A** is a block diagram illustrating the interaction between an application, a tracking service and a tip service in deciding whether to display a tip in the preferred embodiment of the present invention.

FIG. **10B** is a flow chart illustrating the steps performed in deciding whether to display a tip in the preferred embodiment of the present invention.

FIG. **11A** is a block diagram illustrating the interaction between an application, actor services and the character data file in playing an animation in the preferred embodiment of the present invention.

FIG. **11B** is a flow chart illustrating the steps performed in the preferred embodiment of the present invention to play an animation.

FIG. **12** is a flow chart illustrating the steps performed when a known user attempts to log on in the preferred embodiment of the present invention.

FIG. **13** is an example of an outside screen used in the preferred embodiment of the present invention.

FIG. **14** is a flow chart illustrating the steps that are performed when a new user attempts to log on in the preferred embodiment of the present invention.

FIG. **15** is a diagram illustrating exemplary layout for the rooms of a home in accordance with the preferred embodiment of the present invention.

FIG. **16** is an example of a castle-style study generated in accordance with the preferred embodiment of the present invention.

FIG. 17A illustrates the appearance of graphical objects in a room when a contemporary style is chosen for the room in accordance with the preferred embodiment of the present invention.

FIG. 17B is a diagram illustrating graphical objects for a room when a space-style is chosen for the room in the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment of the present invention provides a software development platform that provides a friendly and intuitive user interface. The user interface provided by the software development platform adopts a real world metaphor so that it is readily recognizable to users and not intimidating to novice users. The user interface helps to minimize the time required to learn to use the computer and also helps to demystify the computer to novice users. The user interface presents the user with an environment that resembles rooms of a house and provides each user with a personal character that serves as a guide and assistant.

FIG. **1** is a block diagram of a data processing system **10** that is suitable for practicing the preferred embodiment of the present invention. The data processing system **10** includes a central processing unit (CPU) **12** for controlling operation of the data processing system **10** and a number of peripheral devices, including a keyboard **14**, a video display **16**, an audio output device **17**, a mouse **18**, a secondary storage device **20**, and a memory **22**.

Those skilled in the art will appreciate that the data processing system **10** of FIG. **1** is intended to be merely illustrative and that the present invention may also be practiced in other environments, such as in an electronic wallet or an intelligent television set.

The memory **22** holds the software development platform **24** of the preferred embodiment of the present invention. The software development platform **24** includes three modularized components: services **26**, applications **28** and a shell **30**. These three components **26**, **28** and **30** will be described in more detail below.

The software development platform **24** may be viewed as a hybrid between an operating system and a software suite. It provides functionality that resembles an operating system through the services **26** and the shell **30**. On the other hand, the software development platform **24** provides functionality that resembles a suite in that it provides a number of different applications **28** to the user.

Those skilled in the art will appreciate that the present invention may be practiced on data processing configurations that differ from that depicted in FIG. **1**. The data processing system depicted in FIG. **1** is intended merely to be illustrative. Those skilled in the art will also appreciate that the services **26**, applications **28** and shell **30** may be implemented in a number of different ways, including as objects that comply with the component object model set forth in the OLE 2.0 protocol of Microsoft Corporation of Redmond, Wash.

In order to fully understand the preferred embodiment of the present invention, it is helpful to first introduce a few relevant concepts. One such concept is the notion of an "object". An object is a logical structure that includes data structures for holding data. An object may include functions that operate on the data held in the data structures. An object, in some instances holds only data and does not hold any functions.

Another concept that is utilized in the preferred embodiment of the present invention is an "interface". An interface is a named set of logically-related functions that allow, for example, a user to access the services **26** and applications **20**. An interface lists signatures, such as parameters, for a set of functions. An interface does not provide code for implementing functions; rather, the code for implementing functions is provided by objects. Objects that provide the code for implementing such functions of an interface are said to "support" the interface. The code provided by an object that supports an interface must comply with the signatures that are set forth in the interface definition. In the C++ programming language, an interface is a set of virtual functions.

The services **26** provide functionality that may be called by clients, such as applications **28** or the shell **30**. In the preferred embodiment of the present invention, the services **26** are implemented as OLE 2.0 component objects. They provide services to clients by making instances of interfaces (that they support) available to clients. Component objects are described in more detail in "Inside OLE 2," by Kraig Brockschmidt, Microsoft Press, 1994. Examples of what is a service **26** will be given below.

The applications **28** are oriented to specialized tasks rather than to generalized functions. For example, in some implementations, the applications **28** may include a letter writer for writing letters and a resume writer for writing resumes rather than including a word processing application for performing both such tasks. The task-oriented nature of the applications **28** makes it easier for the user to decide which application to use to perform a given task.

The applications **28** are developed to encourage personal interaction between the user and characters. As will be described in more detail below, the characters serve as assistants that aid the user in performing tasks. The characters are designed to encourage social interaction with the user. The applications **28** interact with the user via the user interface elements, such as the personal character, that are also utilized in the shell. The applications **28** appear in the shell **30** as objects that can be organized, modified or launched. The applications **28** take advantage of the services **26** provided by the software development platform **24** to present the user with a consistent and readily recognizable user interface.

The shell **30** is analogous to an operating system shell. The shell **30** provides a user interface to the user that allows the user access to the applications **28** and services **26**. As was mentioned above, the shell **30** provides a user interface that has a real world metaphor. The user interface resembles one or more rooms of a house. Each room contains objects that may be manipulated to perform a desired task. The objects are intuitively assigned to assist the, user in performing tasks. For example, to invoke a calendar program, the user merely needs to double-click the mouse **18** on a graphical calendar object that has the appearance of a calendar.

In order to understand the user interface provided by the shell **30**, it is helpful to examine an example. The user interface includes two primary elements: characters and rooms. FIG. **2** shows an example of a room **32** that is provided by the shell **30**. The room **32** is a screen that is displayed on the video display **16**. The room **32** shown in FIG. **2** is one of many rooms that may be provided the shell **30**. The user interface shown in FIG. **2** also includes a personal character **34** that provides the user with assistance in using the data processing system **10**.

The use of characters within the preferred embodiment of the present invention and the use of the interface that resembles one or more rooms of a home in the preferred embodiment of the present invention will be described in

more detail below. The discussion initially focuses on the use of characters and then later focuses on the use of the interface that resembles rooms of a house.

Each user is assigned a "personal character." The character is "personal" in that it is assigned on a per-user basis. Nevertheless, different users may be assigned a same personal character. The user may choose a personal character or have a default personal character assigned. The shell **30** provides a user interface that allows a user to choose a personal character or change a personal character. The personal character provides the user with a tool that assists the user in performing tasks. The user interacts with the personal character in a social fashion as if the character were another person. The personal character of a user is continuously present (except in a few instances) to help the user in performing tasks. Examples of actions that the personal character may perform include personally greeting a user, telling the user what the user can and cannot do, providing expertise on matters related to using the computer and informing the user of important events and engagements.

As shown in FIG. **2**, the personal character **34** is consistently shown on the video display **16** in the lower right-hand corner in the preferred embodiment of the present invention. Alternatively, the personal character may move about the screen in some embodiments of the present invention. Moreover, in some alternative embodiments, the personal character may appear and disappear based on user actions or system events. The personal character **34** often provides assistance to the user by displaying speech balloons (see balloon **35** in FIG. **2**). The speech balloons present the user with text that contains helpful information and/or controls that allow the user to perform tasks. For example, speech balloon **25** includes the text: "Greetings, Sam", the "Start an activity" button control and the "Other options" button control. Alternatively, the speech balloon may include text but not controls. The controls may be relegated to a separate menu or other user interface element.

Each personal character may perform a number of different animations. Each personal character has its own "personality" that is reflected in its animations. The personality of the character is also reflected in the contents of its speech balloons and generally in its interactions with the user. At any point in time a user may replace a personal character with another personal character whose behavior and personality are more to the liking of the user.

"Specialist characters" are also provided in the preferred embodiment. Specialist characters are similar to personal characters, but specialist characters appear only when the user is performing a specialized task. Each specialist character has a personality and a demeanor that is well suited for its specialized task. Moreover, its vocabulary is especially adapted for the task at hand and it may have a greater helpfulness index to provide the user with a greater amount of assistance than the personal character. The specialist character is an expert that helps the user to better perform a critical specialized task. For example, FIG. **3** shows an example of a plant specialist character **36** who appears in a gardening application program. She provides advice and options via speech balloon **37**. A specialist character may have greater credibility and is provided to gain the trust of the user in performing a specialized task. A specialist character replaces the personal character of a user when the specialized task is to be performed. When the specialized task is completed, the personal character returns to replace the specialist character. Thus, a user may have available a whole family of characters that include his personal character as well as a number of specialist characters. A specialist character is generally created and controlled by an application **28**.

In an alternative embodiment, the personal character is not replaced but, rather, the appearance of the personal character changes. For example, if the user invokes a spreadsheet program, the personal character might don a green visor, change his vocabulary and be more helpful than usual.

For each character (e.g., each personal character or each specialist character), the software development platform **24** stores a data file **39** that describes critical characteristics of the character. Those skilled in the art will appreciate that the data may be stored in multiple files rather than a single file. The data stored in the data file **39** is used to generate actions by the character, as will be described in more detail below. FIG. **4** illustrates the major types of data that are stored in the data file **39** for each character. In the preferred embodiment, each instance of a character is an object that supports interfaces for performing tasks. Application program interfaces (APIs) are provided to allow applications **28** to use such characters. Those skilled in the art will appreciate that other types of data may also be stored in file **39**. animations **40** that may be performed by the characters are stored as metafiles or bitmaps in the data file **39**. For example, an animation illustrating the personal character jumping up and down, an animation illustrating the character sleeping and an animation illustrating the character pacing may also be stored in the data file **39**.

Vocabulary data **44** is also stored in the file **39**. The vocabulary data **44** is a table of vocabulary snippets that may be used to form text contained within character speech balloons. Examples of vocabulary snippets include a snippet for the character's name, a snippet for introducing the character, a snippet for greeting a user, a snippet for providing a farewell and a snippet for sounding an alarm. Those skilled in the art will appreciate that other snippets may also be stored in the vocabulary data **44**. All characters need not have the same vocabulary. In fact, preferably, each character has a unique vocabulary.

History data **46** is stored for each character. The history data **46** includes a snapshot of the character and personal information. The snapshot is a bitmap or metafile that depicts the character. The personal information includes the name, sex, hometown, a helpfulness index (in the range of 0–6) and other attributes. The helpfulness index is a quantitative value that indicates how likely the character is to provide instructions to the user. Certain characters are designed to be more helpful than others, as reflected in larger values for their helpfulness indices. Characters with different degrees of helpfulness are provided to better suit the needs and personalities of users.

Lastly, code **50** may be stored in the data file **39**. The code **50** provides added functionality for the character. The code **50** is optional and is used to enhance the capabilities of the character. For example, code may be provided to track user actions. By tracking user actions, the character is more likely to be able to anticipate a user's needs and to help the user avoid common pitfalls. In addition, the code **50** may provide added functionality, such as voice recognition, voice activation and other intelligence that enhances the capabilities of the character.

The software development platform **24** provides a user with a choice from a number of different personal characters. The shell **30** provides a dialog that allows the user to select the personal character that the user desires. FIG. **5** illustrates an example of the user interface that is provided for selecting

a personal character. The user interface is organized as a photo-book, where each page shows the snapshot of the character and information about the character. Speech balloons are provided that have controls for selecting or rejecting the viewed character.

The software development platform **24** also provides a character editor as part of the services **26** that allows a user to create new characters. FIG. **6** is a flow chart showing the steps performed to create a character using the character editor. FIG. **7** shows an example screen shot of the character editor in use. Initially, the user must create cast members (i.e., generate bitmaps for the cast members) or locate a file that holds cast members (step **52** in FIG. **6**). Cast members are the graphical pieces of a character. For example, the cast members of a dog personal character (labeled 20–39) are shown in FIG. **7**. Cast members, the various parts of the dog, include the dog's head, eyes and snout (cast members 20–22) and the dog's eyes (cast members 23–28). These cast members are stored as either bitmaps or metafiles. In the preferred embodiment of the present invention, the cast members are stored as metafiles to minimize memory requirements for the cast members and animations, and to all smooth display at differing resolutions.

Once the user has provided cast members, the cast members are imported into the character editor (step **54** in FIG. **6**). This allows the character editor to gain access to the cast members. The character editor is then used to create a rest pose frame from the cast members (step **56**). The rest pose frame is an animation frame showing the character at rest. Each animation begins and ends with such a rest pose frame.

The character editor is also used to produce animations which include collections of video frames that are played in order to create the illusion of movement by the character. Each frame holds the video data necessary to display the character in a given position. Sound may be added to the animation. For example, in FIG. **7** the character editor is being used to create frame **3** of an animation. The sound is stored in separate sound frames. The sounds are stored as waveforms that may be replayed along with the sequence of video frames. Alternatively, voice synthesis techniques may be employed to generate sound.

FIG. **8** shows a sequence of video frames **78**, **80**, **82** and **84** that are part of an animation for the dog personal character. Although the animation that is shown in FIG. **8** is two dimensional, those skilled in the art will appreciate that the characters may also have three-dimensional animations. Once a rest pose frame has been created (step **56**), the cast members are used to create the remaining frames of the animation (step **58**). As can be seen by examining FIGS. **7** and **8**, the rest pose frame **78** was created using cast members. Similarly, frame **80** is created using other cast members. For personal characters, a separate animation is provided for each designated action that the character may perform or for each command to which the character is responsive.

Once the animations are created (step **58**), the history data **46** is interactively obtained from the user for the newly created character. The character editor provides edit boxes to edit the personal information stored in the history data **46**. In addition, the snapshot of the character stored in the history data **46** may be manipulated so as to specify a metafile or a bitmap that holds as the snapshot of the character.

The vocabulary data **44** of the character is then interactively obtained from the user (step **62**). Lastly, the obtained data is saved in the data file **39** for the character (step **64**).

The vocabulary data **44** stored in the data file **39** is used to display text within a speech balloon of a character. A speech balloon service is provided as part of the services **26** (FIG. **1**) of the software development platform **24**. The role of the speech balloon service is to retrieve vocabulary snippets from the vocabulary data **44** held within the data file **39**. The retrieving of vocabulary snippets will be described in more detail below relative to FIGS. **9A** and **9B**. The retrieved snippets may also act as input to a voice synthesis portion of the system that produces corresponding audio output.

Vocabulary snippets are provided for a number of different purposes. Each purpose has an associated snippet name. For each snippet name, there may be up to 30,000 snippets provided. For example, the exclamation snippet name may include "On my!", "Wow!" and "Excellent!" as snippets, which express a character's excitement. The snippets stored under each snippet name are indexed to permit easy access.

System services that are provided as part of the services **26** draw the speech balloon at the request of an application **28**. The contents of the speech balloon (i.e., the text and controls contained therein) are the responsibility of the application. FIG. **9B** shows a flow chart of the steps performed by an application to obtain a text snippet. Initially, the application **28** (FIG. **9A**) sends a request **88** for a snippet by name to the speech balloon service **86** (step **94** in FIG. **9B**). As there may be multiple snippets stored for the requested snippet name, the speech balloon services **86** must decide which snippet to retrieve from the character data file **39** (step **96** in FIG. **9B**) The speech balloon service **86** may, for example, use a weighted random method to determine which snippet to retrieve. For example, a random value may be generated. The random value is then used as an index for retrieving a snippet **92** amongst those stored under the snippet name. Thus, for instance, the snippet used to express character excitement varies so as to make interaction with the character more interesting.

The indexed snippet **92** is then retrieved from the character data file **39** by the speech balloon service **86** (step **98** in FIG. **9B**). The speech balloon service **86** forwards the snippet **92** to the application **28** (step **100** in FIG. **9B**). The application **28** displays the snippet in a speech balloon (step **102** in FIG. **9B**).

The speech balloons displayed by the preferred embodiment of the present invention may include tips. Tips are useful information provided by a character to assist the user in performing a task. Typically, a tip is displayed when a user does something wrong. Tips may, however, be triggered by other events to help the user avoid this pitfall in the future. To provide such tips, the preferred embodiment includes a tip service **104** and a tracking service **105**, as shown in FIG. **10A**. The tip service **104** and the tracking service **105** are part of the system services **26** and interact with the application **28** to guide the application in deciding when to provide tips. The tip service **104** has access to a number of tips **103** for which it may display. The tips are stored in data structures that are provided from the application **28** when it is initially loaded.

A separate data structure is stored for each tip. The data structure holds the number of lives for the tip, the sensitivity index of the tip (0–48), an identifier for the tip and a specification of how to display the tip. The sensitivity index specifies some measure of how frequently the user must perform a triggering event before a tip will be displayed. The sensitivity index reflects an empirically derived estimate of how frequently a tip should be displayed based on the number of occurrences of a triggering event. The sensitivity index is used along with the helpfulness index of the

personal character to determine when a tip is to be displayed. This calculation will be discussed below. The number of lives value stored for a tip specifies how may times a tip will be displayed before it will no longer be displayed.

The tip service **104** is responsible for retrieving the tip and providing the necessary information to display the tip in a speech balloon. The tracking service monitors user activities to determine when to display the tip.

FIG. **10**B is a flow chart illustrating the steps that are performed to determine whether to display a tip. Initially, a user performs a triggering event (step **106**). For example, suppose that a user is typing a word processing document and manually inserts carriage returns when the word processing program will automatically insert a carriage return. The entering of a manual carriage return by the user is a triggering event.

The application **28** then tells the tracking service **105** of the occurrence of the triggering event (step **107**). As was mentioned above, each tip stores a value that specifies the number of lives of the tip. Each time that the user performs the correct action (i.e., an action that if performed incorrectly would trigger a tip), the number of lives is decremented by 1. In addition, when the tip gets displayed, the number of lives is also decremented by 1. Before a tip may be displayed, a determination is made whether the number of lives is greater than 0 (step **108**) . If the number of lives is greater than zero, the tracking service **105** decrements the count it maintains (step **109**).

In contrast, if the number of lives is less than or equal to 0, the tip is not displayed, because the number of lives have been extinguished. The number of lives can be incremented or reinitialized. For example, the number of lives may be reinitialized periodically if the user has not used the system or if the tip has not been displayed for a predetermined period of time.

For each user and tip pair, a separate count is maintained. The count is initially set equal to the sensitivity index and is decremented by the helpfulness index of the personal character each time that the triggering event occurs. For instance, suppose that the sensitivity index for a tip is "18" and the helpfulness index for the personal character is "6". Each time the triggering event occurs, the count is decremented by "6".

Whenever the count is decremented, the tracking service **105** checks whether the count is less than or equal to 0 (step **110**). In the example given above, the third time the triggering event occurs, the sensitivity index equals 0. In the two previous occurrences, in step **110** it is determined that the count is not less than or equal to 0 and, hence, the tip is not displayed. If the count is greater than 0, the tip is displayed (step **111**).

The tip is displayed by the tracking service **105** telling the tip service **104** to display the tip. The tip service **104** provides requisite information to the application **28** to display the tip in the speech balloon. As mentioned above, data structures for the tip are provided on a per-application basis. It should be appreciated that the tips may be applied across application boundaries. For instance, certain tips may be applicable to different applications. Accordingly, the tip may be applied across application boundaries.

The services **26** that are provided in the software development platform **24** (FIG. 1) also include actor services for animating the characters. FIG. **11**A shows the components that play a role in playing such animations, and FIG. **11**B shows a flow chart of the steps performed to play such an animation. Initially, an application **28** sends a command **114** to actor services **112** to request that the character perform a particular action (step **116** in FIG. 11B). The actor services **112** consult a table **113** that associates commands with animations. In particular, the table **113** tells the actor services **112** what animation to retrieve for the given command **114**. The actor services **112** then retrieves the animation that is appropriate for the command **114** (step **117** in FIG. 11B) The retrieved animation **115** is played by actor services **112** (step **118** in FIG. 11B). The actor services **112** include timing mechanisms that allow the animation to be played properly and smoothly. In particular, a system timer is provided and set to specify when a next frame in an animation sequence is to be played. The actor services calculate which frame to next display and set the timer accordingly.

The animations **40** stored within the data file **39** includes video frames as well as duration and timing information. The animations **40** also may include audio information and conditional branching information. The conditional branching information allows the play sequence of frames to vary so that, under certain conditions, the frames are played at a different sequence than they are normally played. The idea behind the conditional branching is to make sure that the same animation is not played repeatedly. The conditional branching mechanism uses a random number generator that generates a random number in the range 0–8000 in hexadecimal notation. The range of possible values of random number is divided into subranges, wherein each subrange is associated with a corresponding branch. The size of the subrange depends on the probability that the associated branch will be taken. Thus, for example, a branch with an 80 percent probability of occurring is assigned a subrange that constitutes 80 percent of the range between 0 and 8000 (hex). It is then determined which subrange the random number falls in, and the associated branch for the subrange is played at the point of the conditional branch.

The conditional branching is particularly useful for the idle animation. The idle animation is displayed whenever no other commands have been send to the actor services **112**. It should be appreciated that the idle animation may be requested by applications **28** and by the shell **30**. More generally, the application **28** shown in FIG. **11**A and the application **28** shown in FIG. **9**A may be the shell **30** or other applications. Since the idle animation is shown so frequently, the conditional branching is desirable within the idle animation to vary the animation sequence that is shown to the user.

In the preferred embodiment of the present invention, characters are aware of users and the surrounding environment. In particular, characters are aware of the age and gender of the user and may be aware of additional user information derived from user tracking software. For instance, a character may refer to a female user as "Mme." and may refer to a male user as "Sir". Characters are also aware of their surrounding environments so that they are aware of current date and time. For example, if a user logs in during the morning, the character may greet the user with "Good morning". In contrast, if the user logs on in the evening, the character may greet the user with "Good evening". As a further example, certain actions that a character performs may be triggered by timing. For example, a character may be developed so as to produce a speech balloon that says "Time for lunch" when the clock reads 12 noon.

Through the use of personal and specialist characters, the preferred embodiment of the present invention makes the user interface of the shell much more easy to use. These characters are especially well adapted to be used by novice

users without the need for extensive training. Moreover, these characters are consciously designed to be non-intimidating to users. As such, users feel more at ease using the software platform of the preferred embodiment than using conventional software products.

The above discussion has focused on characters and their use within the preferred embodiment of the present invention. The discussion below focuses on the home user interface provided by the shell **30** (FIG. **1**) of the preferred embodiment of the present invention.

The shell **30** provides the user with the ability to log on and gain access to the rooms that constitute his "home". FIG. **12** is a flow chart of the steps that are performed during a log-on sequence in the preferred embodiment of the present invention. Initially, an outside screen depicting a front door of the home of a user is shown on the video display **16** (step **119** in FIG. **12**). When the user clicks the mouse **18** when a cursor is anywhere on the screen that depicts the front door of the home, a log-on balloon is displayed as shown in FIG. **13** (step **120**). The log-on balloon includes a list of options where the user can specify whether he is a new user or not (see step **121** in FIG. **12**). If the user is not a new user, a balloon is displayed that contains an edit box for requesting a password (step **122**). After the user has entered the password, a determination is made whether the user entered the correct password or not (see step **124**). If the user did not enter the correct password, an error balloon is displayed (step **126**), and then the user is requested to again enter his password (step **122**). If, instead, the user enters the correct password, it is determined whether the user has logged on previously or not (see step **128**). If the user has logged on previously, the last room that the user was in is displayed on the video display **16** (step **132** in FIG. **12**). On the other hand, if this is the first time the user has logged on, a default room of the home (e.g., the study) is displayed on the video display **16** (step **130** in FIG. **12**).

If in step **120**, it is determined that the user is a new user, the steps shown in FIG. **14** are performed. Initially, text is displayed that welcomes the user (step **134** in FIG. **14**). The shell **30** then displays check boxes and fields for the user to complete (step **136**). The user selects check-boxes and enters requested information in the fields. A password edit box is then displayed (step **138**). The user enters the proposed password into the edit box. A confirmation password edit box is subsequently displayed to confirm the password that the user has entered (step **140**). If the user enters a different password than he first entered (see step **142**), the confirmation edit box is again displayed (see step **140**). In contrast, if the user enters the correct password, descriptive information about the home user interface is displayed (step **144**). Lastly, the user enters the home and is shown the default room of the home (step **146**).

The home that is provided by the software development platform **24** (FIG. **1**) is a series of rooms which are connected to each other via passageways. The passageways provide a mechanism for a user to move between the rooms of the home. Passageways may be doors or other types of passageways. FIG. **15** depicts the rooms that are included in a typical house in accordance with the preferred embodiment of the present invention. The home shown in FIG. **13** includes an attic **148**, a study **150**, a conservatory **152**, a workshop **154**, a kitchen **156**, a family room **158** and a kids room **158**. The home also includes the inside of a safe **162**, the inside of a drawer **164** and the inside of a mouse hole **166**. The darkened arrows shown in FIG. **13** indicate doorways that connect the rooms. The lighter arrows indicate passageways that are not doorways.

When a room is displayed, the room occupies the full screen of the video display **16**. Each room contains walls, a ceiling, a floor and a set of objects. The walls cannot be moved or resized. The nature of the room determines which objects are included in the room by default. For example, study **150** includes a desk and a lamp. Rooms cannot be changed into other types of rooms. For example, a kitchen cannot be changed into a family room. Rooms can be added and deleted from the home. As will be described below, the shell **30** provides a vehicle for making such changes.

Rooms are made up of walls, a ceiling and a floor. Objects are placed on the walls and floor of the room. All objects other than the walls, the ceilings and the floors can be moved within the room and can be resized. FIG. **14** shows an example of a study **32** that includes these elements.

The shell **30** (FIG. **1**) provides a default home style. The default home style is the contemporary home style. The home style dictates the appearance of objects within the respective rooms of the home. In the preferred embodiment of the present invention, four home styles are available. These home styles are: contemporary, castle, retro- and post-modern.

Each window in the home has an outside view. Animations may be provided as part of this outside view or static images may be provided. For example, a window may show an outside view of the ocean, scenes from Paris or scenes from a desert.

To help illustrate the difference between home styles, FIG. **16** shows a study in the castle home style. The study shown in FIG. **16** may be contrasted with the contemporary study shown in FIG. **2**. Each of the studies contains many of the same objects, but the appearance of the objects differ according to the style.

A user may change the style of a room. The shell **30** provides a balloon that provides a user the option of changing the style of the room. The entire style of a house may be changed by changing the style of each of the rooms to the desired new style.

FIGS. **17A** and **17B** illustrate the change in appearance of objects when the style of the room is changed from contemporary to a space style. FIG. **17A** shows a couch **168**, a balloon **170** and a coffee table **172** for a room in the contemporary home style. When the style of the room is changed to the space style as shown in FIG. **17B**, the appearance of the couch **168'** is changed, as is the appearance of the coffee table **172'**. The appearance of the balloon **170**, however, does not change. This is because there is no new image for the balloon in the new style. In changing room styles, the preferred embodiment of the present invention changes the style of each object that has an image in the new style, but it does not change an object that does not have an image in the new style.

The default home includes a default set of rooms and a default location for objects within each room. Each room has at least one passageway. The door **174** shown in FIG. **15** is an example of a passageway. A passageway is a special kind of object that when clicked on (i.e., when the cursor points to the object and the mouse button is quickly pressed and released) presents the user with a balloon. The balloon provides the option to jump to a specified room or to change the passageway. If the user wishes to go straight to the passageway to the new room, the user double clicks on the passageway.

The objects provided in each room are of three varieties: passive objects, active objects and passage-way objects. The passage-way objects have been discussed above. Passive

objects are objects that are shown in a room merely for decorative purposes and do not provide a mechanism for activating an application or moving to a new room. Active objects provide extended properties and allow a user to invoke an application. Table **176** is an example of a passive object. Calendar **178**, in contrast, is an example of an active object. The user positions the mouse on the calendar, double clicks and the calendar program is invoked.

The objects may include their own code for handling the display of the objects, for handling the user interface for the object and for providing additional functionality for the object. For example, a cellular phone object might be provided that follows the user from room to room. The cellular phone object flashes a light when the user has received voice mail and presents a custom balloon that lets you listen to messages or speed dial numbers when the object is clicked upon.

It should also be appreciated that objects may be animated just like characters. Such animations may include sounds, commands and conditional branching as described above for the characters. The more traditional objects are merely still images.

Those skilled in the art will appreciate that the real world metaphor adopted by the preferred embodiment of the present invention may be extended to provide alternative user interfaces that differ from the home interface. For example, the interface may resemble a town or city.

The preferred embodiment of the present invention provides a user interface that is easy to use, non-threatening and helpful. Users readily accept the home metaphor provided by the user interface. The characters provided in the preferred embodiment act as friendly centralized services of assistance.

While the present invention has been described with reference to a preferred embodiment thereof, those skilled in the art will appreciate that various changes in form and detail may be made without departing from the intended scope of the present invention, as defined in the appended claims.

What is claimed is:

1. In a data processing system having a video display, a storage for storing computer programs, a processor for running the computer programs including application programs and a software development platform, the software development platform being a hybrid between a software suite and an operating system having a service for displaying on the video display at least one animated character created by the service for use by application programs, wherein the software development platform displays a system user interface, said system user interface including mechanisms for invoking the application programs, a method comprising the steps of:

as part of running the software development platform that displays the system user interface on the processor,

displaying the animated character on the video display via the service;

outputting information to assist a user via the animated character; as part of running a selected one of the application programs on the processor,

displaying the animated character on the video display via the service; and

outputting information to assist the user via the animated character.

2. The method of claim **1** wherein the step of outputting information to assist the user via the animated character when running the software development platform that displays a system user interface comprises the step of displaying an animation of the animated character on the video display.

3. The method of claim **1** wherein the step of outputting information to assist the user via the animated character when running the software development platform that displays a system user interface comprises the step of displaying textual help information on the video display.

4. The method of claim **1** wherein the data processing system includes an audio output device and the step of outputting information to assist the user via the animated character when running the software development platform that displays a system user interface comprises the step of outputting audio information to assist the user over the audio output device.

5. The method of claim **1** wherein the step of outputting information to assist the user via the animated character when running the software development platform that displays a system user interface comprises the step of presenting the user with controls on the video display for performing tasks.

6. The method of claim **1** wherein the step of outputting information to assist the user via the animated character when running the selected one of the application programs comprises the step of displaying an animation of the animated character on the video display.

7. The method of claim **1** wherein the step of outputting information to assist the user via the animated character when running the selected one of the application programs comprises the step of displaying textual help information on the video display.

8. The method of claim **1** wherein the data processing system includes an audio output device and wherein the step of outputting information to assist the user via the animated character when running the selected one of the application programs comprises the step of outputting audio information to assist the user over the audio output device.

9. The method of claim **1** wherein the step of outputting information to assist the user via the animated character when running the selected one of the application programs comprises the step of presenting the user with controls on the video display for performing tasks.

10. In a data processing system having a storage, and a video display, a method comprising the steps of:

providing a software development platform, which is a hybrid between a software suite and an operating system that provides services callable by a software development platform component, that displays a system user interface on the video display, the system user interface including mechanisms for invoking a plurality of application programs;

displaying a personal character on the video display for a user to provide assistance to the user in using said system user interface and at least one of said application programs; and

storing at least one animation of the personal character in the storage.

11. The method of claim **10** further comprising the steps of:

retrieving the animation of the personal character from the storage; and

displaying the animation on the video display.

12. The method of claim **10** wherein the step of storing at least one animation comprises the step of storing audio data in the storage as part of the animation.

13. The method of claim **10** wherein the step of storing at least one animation of the personal character in the storage comprises the step of storing multiple animations of the personal character in the storage.

14. In a data processing system having a video display, a method comprising the steps of:

providing a software development platform, which is a hybrid between a software suite and an operating system that provides services callable by a software development platform component, that displays a system user interface on the video display, the system user interface including mechanisms for invoking a plurality of application programs;

providing a personal character for a user that is displayed on the video display to assist the user in using the system user interface and at least one of said application programs;

providing an animation for the personal character that may be played on the video display, said animation including multiple frames having a first branch of frames and a second branch of frames;

receiving a request to play the animation;

determining a state of a condition to ensure that one animation is not played repeatedly;

based upon the determination of the state of the condition, determining which of the first branch and the second branch to play on the video display; and

playing the determined branch.

15. The method of claim 14 wherein the step of determining the state of the condition comprises the step of determining a random value.

16. The method of claim 14 wherein the step of determining the state of the condition comprises the step of determining a current measure of time.

17. In a data processing system having a video display, a method comprising the steps of:

providing a software development platform that displays a system user interface on the video display, the system user interface including mechanisms for invoking a plurality of application programs;

providing an animated personal character for a user that is displayed on the video display to assist the user in using the system user interface and at least one of said application programs;

invoking a specialized task; and

replacing the personal character with an animated specialized character that is displayed on the video display and that provides assistance to the user as to the specialized task, wherein the specialized character has a personality associated with the specialized task.

18. In a computer system having a processor, a storage, and a video display, a method comprising the steps of:

providing a software development platform that displays a system user interface on the video display, the system user interface including mechanisms for invoking a plurality of application programs;

providing an animated character facility for execution on the processor for providing an animated character to assist a user in using the system user interface and at least one of said application programs;

providing an application program for execution on the processor;

maintaining context information that describes a current context in the storage, said context information including information about a current user;

executing the application program on the processor; and

based on the current context, determining an appearance for the animated character on the video display and displaying the animated character on the video display with the determined appearance.

19. The method of claim 18 wherein the context information includes a current time and the step of determining the appearance of the animated character is based on the current time.

20. The method of claim 18 wherein the context information includes a current date and the step of determining the appearance of the animated character is based on the current date.

21. The method of claim 18 wherein the determined appearance of the animated character comprises an animation of the animated character.

22. The method of claim 18 wherein the determined appearance of the animated character comprises a speech balloon for the animated character.

23. In a computer system having a storage and a video display, a method comprising the steps of:

providing a software development platform that displays a system user interface, said software development platform including an animation character facility for displaying animations of animated characters on the video display for assisting a user in operating the system user interface and a plurality of applications, the system user interface including mechanisms for invoking the plurality of application programs;

encapsulating code and data for each character into a separate object, a selected one of said objects for a selected character including code for tracking user actions;

executing the code for tracking user actions in the selected object to track actions by the user; and

based on the actions by the user that have been tracked by the code for tracking user actions in the selected object, determining what animation of the selected animated character to display on the video display with the animated character facility.

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